D448 PCM TRUNK CARRIER SYSTEM

GENERAL DESCRIPTION

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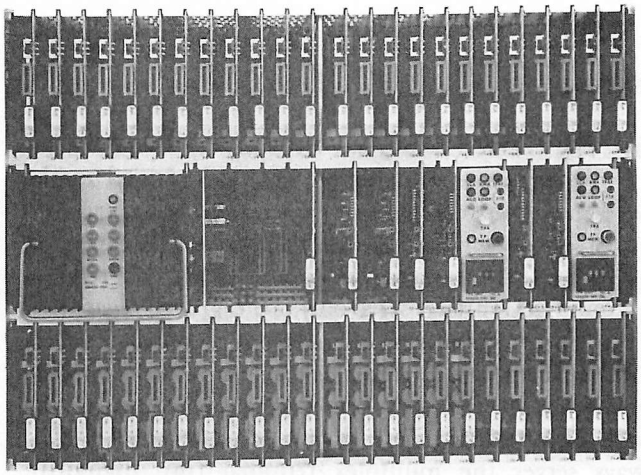
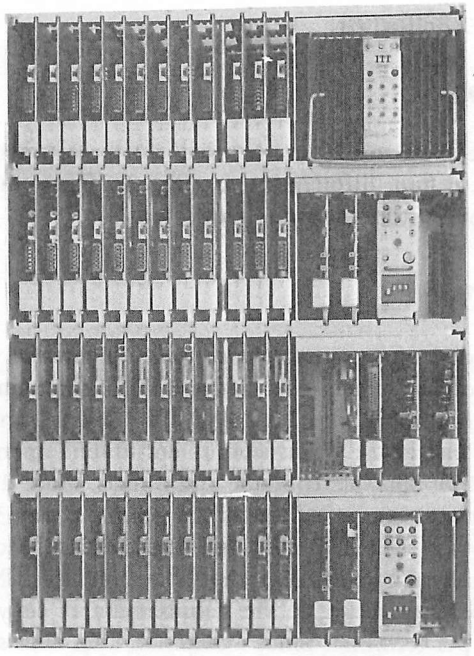


23-Inch D448 Multiplex Terminal



19-Inch D448 Multiplex Terminal

Fig. 1—D448 Multiplex Terminals

1. GENERAL

1.01 This Section provides a general description of the ITT D448 PCM trunk carrier system (Fig. 1).

1.02 This Section has been reissued to add information on new channel units, 8-ft bays, and the Group -003 multiplex shelves which are used with dataport channel units.

1.03 The D448 trunk carrier system is a toll-grade PCM carrier system that is end-to-end compatible with WE and other manufacturers' D1D, D2, D3, and D4-type channel banks and #4 ESS digroup terminals (#4ESS DT). The D448 multiplex terminal provides for multiplexing up to 24, 48, or 96 channels together. Using Mode 3 operation over two T1 (DS1) span lines provides for up to 48

channels. Using Mode 1 or 2 operation over one T1C (DS1C) span line or other compatible digital transmission facility provides for up to 48 channels. Using Mode 4 operation (future) over one T2 (DS2) span line provides for up to 96 channels.

2. DESCRIPTION

GENERAL

2.01 The D448 multiplex terminal is functionally divided into two digroups in Modes 1, 2, and 3 and into four digroups in Mode 4 (future). Each digroup consists of up to 24 channel units and associated common equipment. The transmit logic unit (TLU) and receive logic unit (RLU) always serve only one digroup, regardless of the mode of operation. The trunk processor and alarm (TPA) unit and line interface (LI-) unit are either shared by two digroups or serve only one digroup, depending on the mode of operation. The power converter unit (PCU) always serves the multiplex terminal (two digroups), regardless of the mode of operation.

MODES OF OPERATION

A. General

2.02 The D448 multiplex terminal can be operated in one of four different modes (Fig. 2). These modes are described in the following paragraphs.

B. Mode 1

2.03 Mode 1 operation provides up to 48-channel synchronous service over a single T1C span line at 3.152 Mb/s using a new line code. The output signal is unique in that its use is restricted to end-to-end operation with D448 (or equivalent) Mode 1 terminals. Mode 1 provides the most economical use of the system at the 3.152 Mb/s line rate. The TPA unit and line interface, Mode 1 (LI-1) are shared by both digroups. The economy of Mode 1 operation is reflected in the requirement of only one TPA unit per terminal. Since a common TPA unit serves both digroups in Mode 1 operation, alarms and system looping affect both digroup A and B. All other modes of operation allow for independent digroup alarm display and looping.

C. Mode 2

2.04 Mode 2 operation provides up to 48-channel asynchronous service (independent 24-channel

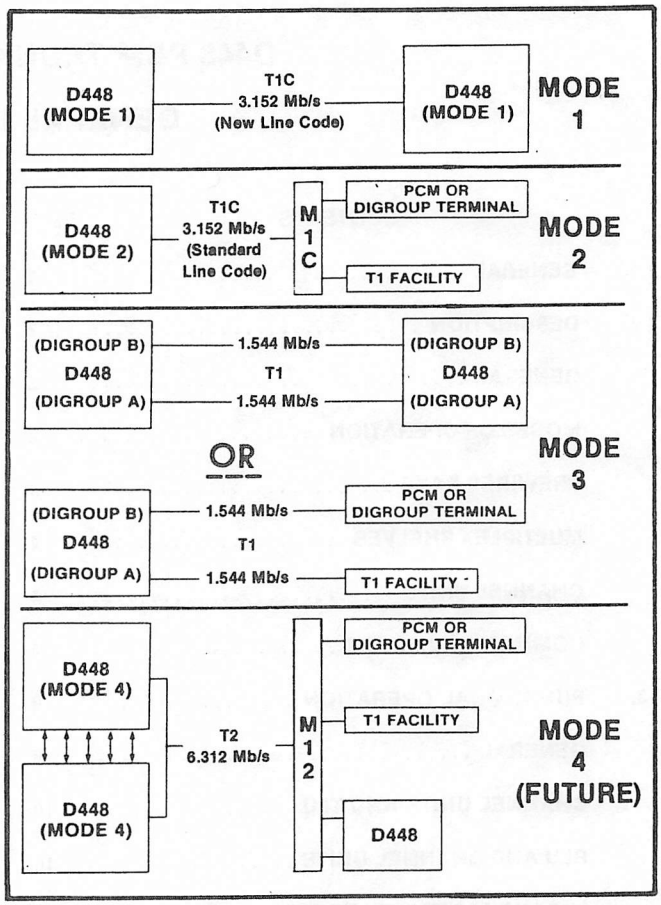


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Fig. 2—D448 Modes of Operation

digroups) over a single T1C span line at 3.152 Mb/s using the standard line code. The output signal is the standard M1C/T1C format. In Mode 2 operation, the terminal is end-to-end compatible with an M1C multiplexer (or equivalent) or a D448 (or equivalent) Mode 2 multiplex terminal. One TPA unit is required per digroup and the line interface, Mode 2 (LI-2) is shared by both digroups.

D. Mode 3

2.05 Mode 3 operation provides dual 24-channel asynchronous service over two independent T1 span lines at 1.544 Mb/s. Each digroup functions totally independent of the other. An ITT, WE or equivalent D1D, D2, or D3 channel bank or D4 terminal digroup can be connected independently end-to-end to each digroup. One TPA unit and one line interface, Mode 3 (LI-3) is required per digroup.

E. Mode 4 (Future)

2.06 Mode 4 operation (future development) provides up to 96-channel asynchronous service over a single

T2 span line at 6.312 Mb/s. In this mode, four digroups are multiplexed together and are end-to-end compatible with an M1-2 multiplexer or D448 (or equivalent) Mode 4 multiplex terminal. One TPA unit is required per digroup. One line interface, Mode 4 transmit (LI-4T) and one line interface, Mode 4 receive (LI-4R) serve all four digroups.

PREWIRED BAYS

2.07 A variety of prewired bays, 23- and 19-inch, are available from ITT. The 23- and 19-inch bays are described in Tables A, B, and C, respectively, and profiles of the different types are shown in Fig. 3 and 4. The prewired bays consist of either 23-inch wide unequal-flange or 19-inch wide channel relay racks equipped with a number of multiplex shelves and a fuse, alarm and distribution panel (FADP). The FADP provides fused power to all shelves in a bay and termination blocks for intrabay or office wiring (except VF connections). VF connections are made directly to the multiplex shelf using VF drop connectors. All 23-inch bays have a removable plate for mounting a communications panel in the flange.

TABLE A

11-FT 6-IN. BAY (600174-800-XXX), 9-FT BAY (600175-800-XXX), AND 7-FT BAY (600176-800-XXX) SUFFIX NUMBERS (-XXX)

NO. OF SHELVES	SHELF TYPE (NOTES 1 AND 2)				BAY HEIGHT
	628001	628005	628011	628015	
1	-001	-011	-021	-031	7 Ft,
2	-002	-012	-022	-032	9 Ft, &
3	-003	-013	-023	-033	11 Ft 6 In.
4	-004	-014	-024	-034	
5	-005	-015	-025	-035	9 Ft & 11 Ft 6 In. ONLY
6	-006	-016	-026	-036	11 Ft 6 In.
7	-007	-017	-027	-037	ONLY

Note 1: Refer to Para. 2.08 for a description of multiplex shelf types.

Note 2: All bays can be ordered with Group -003 multiplex shelves, which are dataport compatible. To order a bay with Group -003 shelves, insert a 1 in the last three digits of the bay part number. For example: a 600174-800-001 7-ft bay equipped with one 628001 (Group -001) shelf, would be ordered as 600174-800-101.

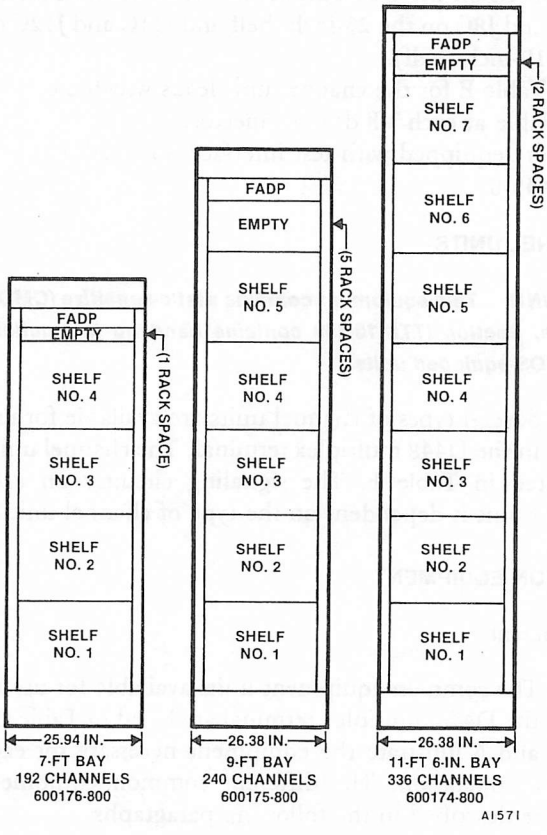


Fig. 3—Prewired Bays (23-Inch)

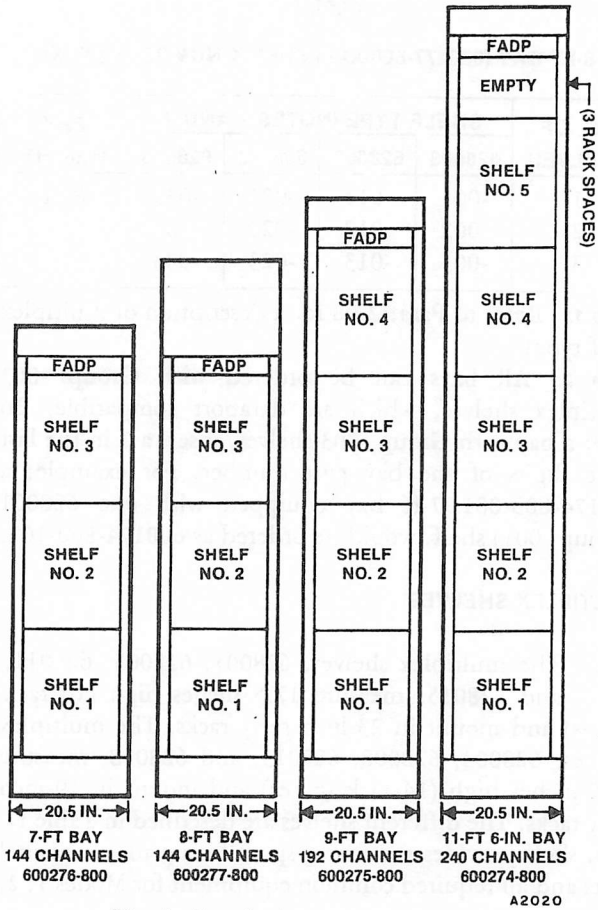


Fig. 4—Prewired Bays (19-Inch)

TABLE B

11-FT 6-IN. BAY (600274-800-XXX), 9-FT BAY (600275-800-XXX), AND 7-FT BAY (600276-800-XXX) SUFFIX NUMBERS (-XXX)

NO. OF SHELVES	SHELF TYPE (NOTES 1 AND 2)				BAY HEIGHT
	628003	628008	628013	628018	
1	-001	-011	-021	-031	7 Ft,
2	-002	-012	-022	-032	9 Ft, &
3	-003	-013	-023	-033	11 Ft 6 In.
4	-004	-014	-024	-034	9 Ft & 11 Ft 6 In. ONLY
5	-005	-015	-025	-035	11 Ft 6 In. ONLY

Note 1: Refer to Para. 2.08 for a description of multiplex shelf types.

Note 2: All bays can be ordered with Group -003 multiplex shelves, which are dataport compatible. To order a bay with Group -003 shelves, insert a 1 in the last three digits of the bay part number. For example: a 600174-800-001 7-ft bay equipped with one 628001 (Group -001) shelf, would be ordered as 600174-800-101.

TABLE C

8-FT BAY (600277-800-XXX) SUFFIX NUMBERS (-XXX)

NO. OF SHELVES	SHELF TYPE (NOTES 1 AND 2)				BAY HEIGHT
	628003	628008	628013	628018	
1	-001	-011	-021	-031	8 Ft
2	-002	-012	-022	-032	
3	-003	-013	-023	-033	

Note 1: Refer to Para. 2.08 for a description of multiplex shelf types.

Note 2: All bays can be ordered with Group -003 multiplex shelves, which are dataport compatible. To order a bay with Group -003 shelves, insert a 1 in the last three digits of the bay part number. For example: a 600174-800-001 7-ft bay equipped with one 628001 (Group -001) shelf, would be ordered as 600174-800-101.

MULTIPLEX SHELVES

2.08 The multiplex shelves, 628001, 628005, 628011, and 628015, measure 17.5 inches high (10 rack spaces) and mount in 23-inch relay racks. The multiplex shelves, 628003, 628008, 628013, and 628018, measure 24.5 inches high (14 rack spaces) and mount in 19-inch relay racks. The different shelves are described in Table D. Each shelf provides mounting space for up to 48 channel units and all required common equipment for Modes 1, 2, and 3. Mode 4 requires the use of two shelves wired together. Customer connections to the shelf are made via 25-pair VF drop connectors (for VF and signaling connections), wire-wrap pins (for alarm, HF, and some signaling connections), and a terminal block (for power connections). Fig. 5 and 6 show the location of the channel units and the common equipment.

TABLE D

MULTIPLEX SHELF VERSIONS

CATALOG NUMBER†	MNEMONIC	RACK WIDTH (In.)	CONNECTORIZATION FORMAT‡
628001**	MS/WC7	23	Universal interface; WE compatible; 7 connectors
628003	MS19/WC7	19	
628005**	MS/WC5	23	Standard interface; WE compatible; 5 connectors
628008	MS19/WC5	19	
628011	MS/C7	23	Universal interface; 7 connectors
628013	MS19/C7	19	
628015	MS/C6	23	Standard interface; 6 connectors
628018	MS19/C6	19	

†Each shelf is equipped with two EQL1, 628045-0, mounted on the DS1 outputs of the shelf (connectors J7C and J8C on the 23-inch shelf and J11C and J12C on the 19-inch shelf).

‡See Table E for the channel unit leads which are available at each VF drop connector.

**Factory-equipped with test interface unit (TIU), 628455-0.

CHANNEL UNITS

WARNING: This equipment contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

2.09 Several types of channel units are available for use in the D448 multiplex terminal. The channel units are listed in Table F. The signaling circuitry on each channel unit is dependent on the type of channel unit.

COMMON EQUIPMENT

A. General

2.10 The common equipment units available for use in the D448 multiplex terminal are listed in Table G. Fig. 5 and 6 illustrate the equipment necessary for each mode of operation. The different common equipment units are described in the following paragraphs.

TABLE E
CONNECTORIZED LEADS

VF DROP CONNECTOR DESIGNATION	CONNECTORIZED LEADS ON							
	628001 & 628003		628005 & 628008		682011 & 628013		628015 & 628018	
	TIP	RING	TIP	RING	TIP	RING	TIP	RING
P25A/P25B	E	EB	E	EB	E	M/ATB	E	M/ATB
P26A/P26B	1/S	2	1/S	2	1/S	2	1/S	2
P27A/P27B	T	R	T	R	T	R	T	R
P28A/P28B	M/ATB	MB	M/ATB	MB	EB	MB	EB	MB
P29A/P29B	T1/A	R1/B	T1/A	R1/B	T1/A	R1/B	T1/A	R1/B
P30A/P30B	NT	NR	Not Supplied		NT	NR	Not Supplied	
P31A/P31B	PC/OS	HS	Not Supplied		PC/OS	HS	PC/OS	HS

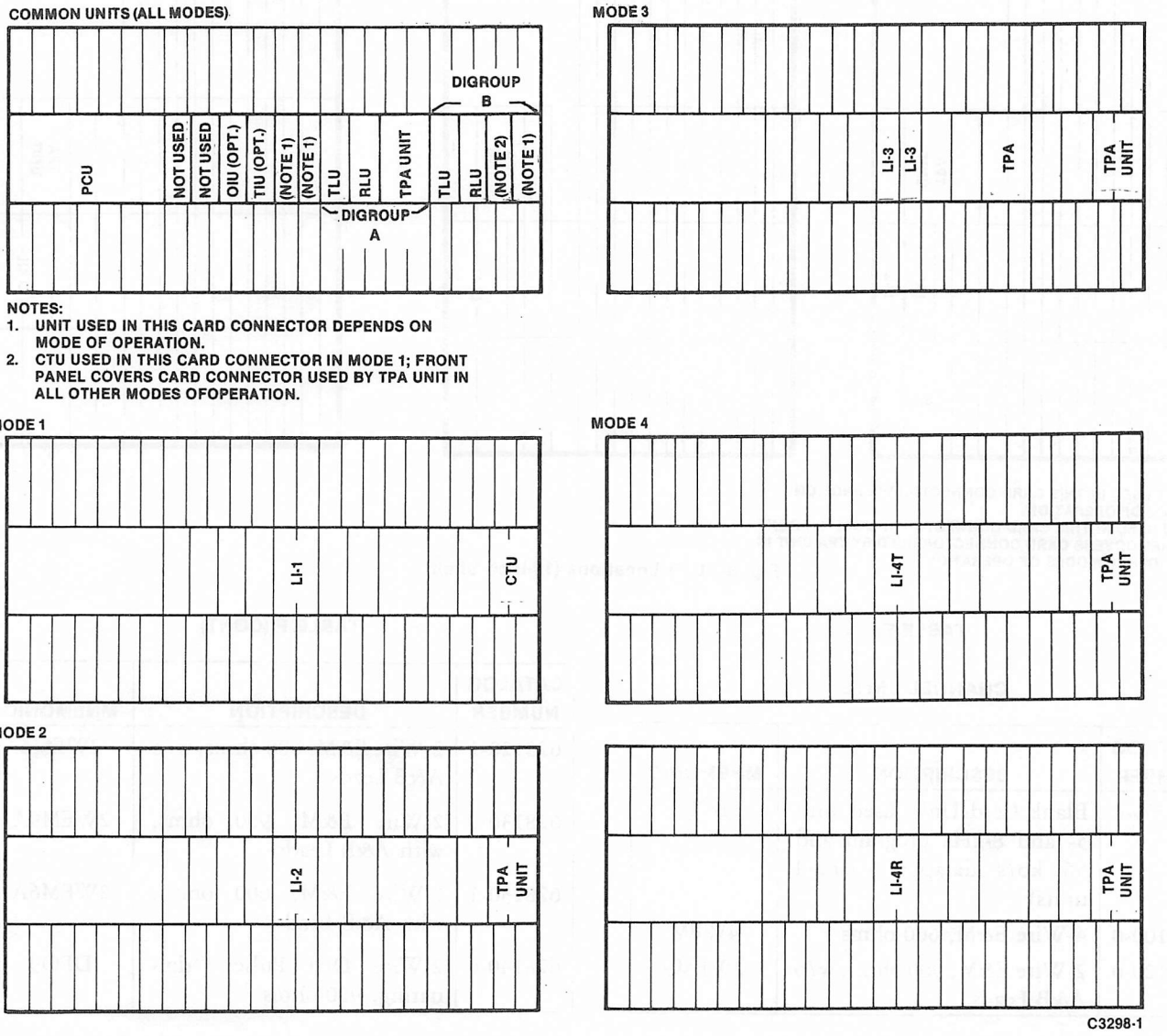
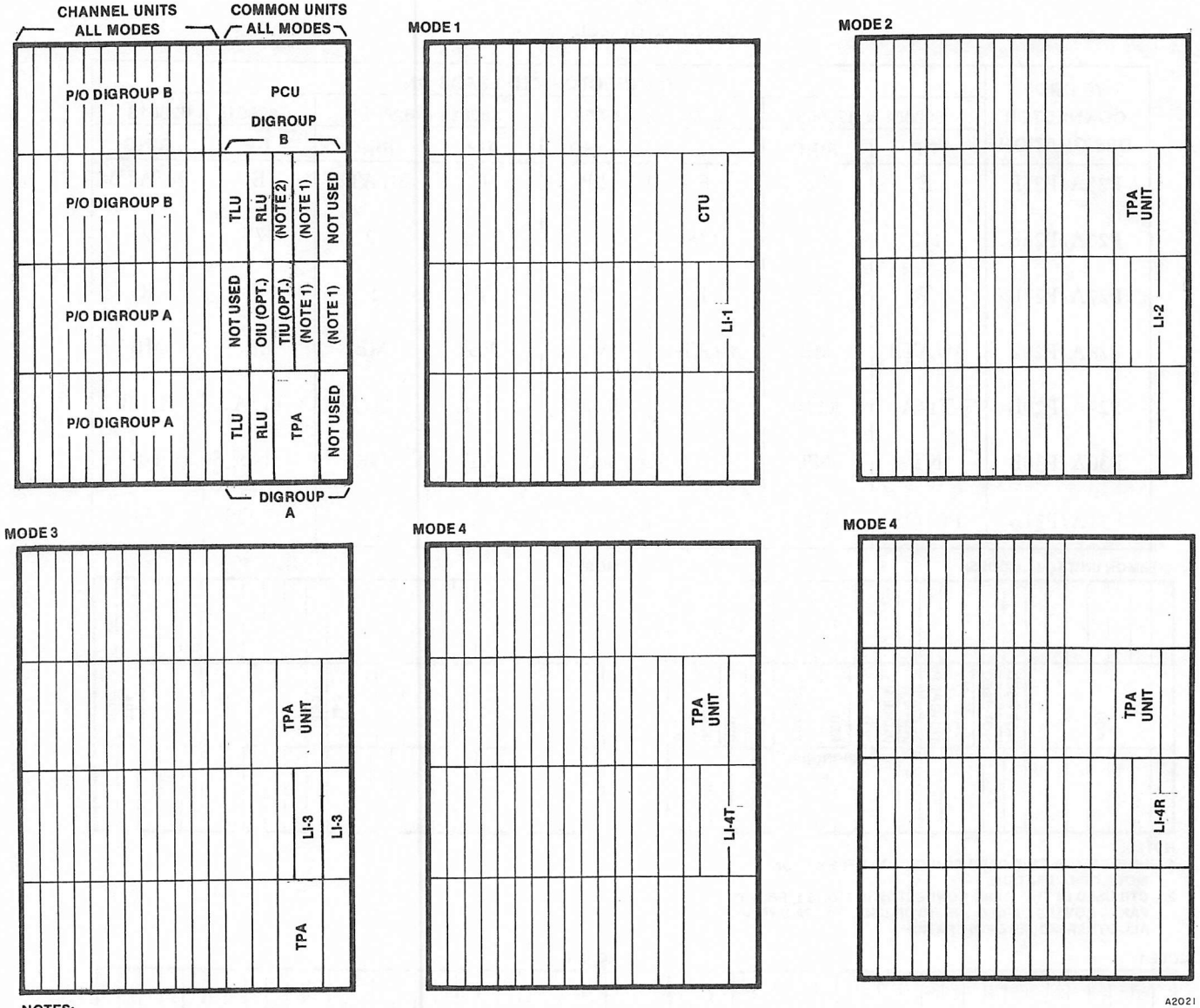


Fig. 5—Unit Locations (23-Inch Shelf)



NOTES:
1. UNIT USED IN THIS CARD CONNECTOR DEPENDS ON MODE OF OPERATION.
2. CTU USED IN THIS CARD CONNECTOR IN MODE 1; FRONT PANEL COVERS CARD CONNECTOR USED BY TPA UNIT IN ALL OTHER MODES OF OPERATION.

Fig. 6—Unit Locations (19-Inch Shelf)

TABLE F

CHANNEL UNITS

CATALOG NUMBER	DESCRIPTION	MNEMONIC
628099-0	Blank Card Unit (used with 5- and 8-kHz program and 56 kb/s dataport channel units)	BCU
628100-0	4-Wire E&M, 600 ohms	4WEM
628120-0	2-Wire E&M, 900 ohms, w/o A&B Leads	2WEM9

TABLE F (CONT)

CATALOG NUMBER	DESCRIPTION	MNEMONIC
628120-1	2-Wire E&M, 600 ohms, w/o A&B Leads	2WEM6
628130-0	2-Wire E&M, 900 ohms, with A&B Leads	2WEM9A
628130-1	2-Wire E&M, 600 ohms, with A&B Leads	2WEM6A
628140-0	2-Wire Dial Pulse Originating, 900 ohms	DPO9

TABLE F (CONT)

CATALOG NUMBER	DESCRIPTION	MNEMONIC
628140-1	2-Wire Dial Pulse Originating, 600 ohms	DPO6
628150-0	3-Wire Dial Pulse Originating, 900 ohms, with Peg Count	SDPO9
628150-1	3-Wire Dial Pulse Originating, 600 ohms, with Peg Count	SDPO6
628155-0	3-Wire Dial Pulse Originating, 900 ohms, with Calling Party Forced Release	SDPOC9
628155-1	3-Wire Dial Pulse Originating, 600 ohms, with Calling Party Forced Release	SDPOC6
628156-0	NX-1E/D Compatible, 900 ohms	NX-1E/D9
628156-1	NX-1E/D Compatible, 600 ohms	NX-1E/D6
628160-0	2-Wire Dial Pulse Terminating, 900 ohms	DPT9
628160-1	2-Wire Dial Pulse Terminating, 600 ohms	DPT6
628170-0	2-Wire Dial Pulse Terminating, 900 ohms, with Integrity Check	DPT9I
628170-1	2-Wire Dial Pulse Terminating, 600 ohms, with Integrity Check	DPT6I
628180-0	2-Wire Foreign Exchange Office, 900 ohms	2WFXO9
628180-1	2-Wire Foreign Exchange Office, 600 ohms	2WFXO6
628184-0	2-Wire Foreign Exchange Office, 900 ohms, with Loop Start	2WFXO/LS9

TABLE F (CONT)

CATALOG NUMBER	DESCRIPTION	MNEMONIC
628184-1	2-Wire Foreign Exchange Office, 600 ohms, with Loop Start	2WFXO/LS6
628190-0	2-Wire Foreign Exchange Subscriber, 900 ohms	2WFXS9
628190-1	2-Wire Foreign Exchange Subscriber, 600 ohms	2WFXS6
628192-0	2-Wire Foreign Exchange Subscriber, 900 ohms, with Extended VF Range	2WFXS/EVF
628200-0	4-Wire Transmission Only, 600 ohms	4WTO
628205-0	4-Wire Transmission Only, 600 ohms, for use with External SF Signaling	4WTO/SF
628210-0	4-Wire Equalized Transmission Only	4WETO
628220-0	4-Wire E&M Pulse Link Repeater, 600 ohms	4WPLR
628230-0	4-Wire Foreign Exchange Office, with VF Response Equalizer	4WFXO/VF
628235-0	4-Wire Foreign Exchange Office, w/o VF Response Equalizer	4WFXO
628240-0	4-Wire Foreign Exchange Subscriber, with VF Response Equalizer	4WFXS/VF
628245-0	4-Wire Foreign Exchange Subscriber, w/o VF Response Equalizer	4WFXS
628255-0	Electronic Toll Switch Channel Unit (ETS-4 Compatible)	ETS-4
628260-0	4-Wire Tandem	4WTDM

TABLE F (CONT)

CATALOG NUMBER	DESCRIPTION	MNEMONIC
628270-0	4-Wire, with Extended VF Range	4WEVF
628275-0	4-Wire, with SF Signaling	4WSF
628280-0	4-Wire Duplex Signaling, with VF Response Equalizer	4WDX/VF
628285-0	4-Wire Duplex Signaling, w/o VF Response Equalizer	4WDX
628290-0	2-Wire Duplex Signaling	2WDX
628295-0	2-Wire Private Line Automatic Ringdown	2WPLAR
628320-0	5-kHz Program, Transmit (requires one BCU)	PGCU5T
628322-0	8-kHz Program, Transmit (requires two BCUs)	PGCU8T
628330-0	5-kHz Program, Receive (requires one BCU)	PGCU5R
628332-0	8-kHz Program, Receive (requires two BCUs)	PGCU8R
628340-0	DS-0 Rate, Dataport, 64.0 kb/s	DS0DP
628342-0	DS-56 kb/s Rate, Dataport (requires one BCU)	DS0DP/56K
628350-0	Office Channel Unit Dataport, 2.4 kb/s	OCUDP/2.4K
628352-0	Office Channel Unit Dataport, 4.8 kb/s	OCUDP/4.8K
628354-0	Office Channel Unit Dataport, 9.6 kb/s	OCUDP/9.6K
628356-0	Office Channel Unit Dataport, 56.0 kb/s	OCUDP/56K
628356-1	Office Channel Unit Dataport, 56.0 kb/s, with Error Correction (requires one BCU)	OCUDP/56K

B. TLU

2.11 This unit is used in all modes of operation. One TLU serves each digroup. PCM data from the digroup channel units is timed and multiplexed together into the desired D1D, D2, or D3 compatible PCM data stream by the TLU. The TLU also adds framing information to the data stream.

TABLE G

COMMON EQUIPMENT

CATALOG NUMBER	NAME	MNEMONIC
628020-0	Transmit Logic Unit	TLU
628025-0	Receive Logic Unit	RLU
628030-0	Trunk Processor and Alarm Unit with CGA Counter	TPA/C
628030-1	Trunk Processor and Alarm Unit w/o CGA Counter	TPA
628035-0	Power Converter Unit	PCU
628045-0	Equalizer for 0 to 133 ft	EQL1
628045-1	Equalizer for 134 to 267 ft	EQL2
628045-2	Equalizer for 268 to 400 ft	EQL3
628045-3	Equalizer for 401 to 533 ft	EQL4
628045-4	Equalizer for 534 to 655 ft	EQL5
628050-0	Line Interface, Mode 1	LI-1
628055-0	Line Interface, Mode 2	LI-2
628060-0	Line Interface, Mode 3	LI-3
628075-0	Cut-Thru Unit	CTU
628090-0	Office Interface Unit for Loop Timing Only	OIU/LT
628095-0	Office Interface Unit for DDS or External Office Clock	OIU/DDS

C. RLU

2.12 This unit is used in all modes of operation. One RLU serves each digroup. This unit receives companded PCM from the distant multiplex terminal, via the LI-, demultiplexes individual channel information, and extracts timing and framing data from the PCM. The RLU provides reframing functions and generates system test codes (1 kHz and quiet).

D. TPA Unit

WARNING: This unit contains static-sensitive (NMOS) devices. Section ITTR-18-599 contains handling instructions for NMOS-equipped units.

2.13 This unit is used in all modes of operation. In Mode 1, one TPA unit serves both digroups. In Modes 2, 3, and 4, one TPA unit serves each digroup. This unit senses system alarm conditions and, during alarm conditions, generates control signals to release connections, terminate toll-service charges, and prevent access by switching equipment. The TPA unit reports (visually and to the office via relay contacts) local and remote alarms and controls digroup (terminal in Mode 1) looping and alarm cutoff. Looping initiated at the TPA unit requires that the digroup (or terminal) be in a CGA condition, and while looped, the CGA condition cannot be cleared. The TPA unit initiates a local alarm if selected common equipment units are removed from the multiplex shelf.

2.14 To assist in maintenance studies, a CGA counter is provided on the TPA/C unit, 628030-0. The CGA counter records all carrier failures which have occurred since the counter was reset.

2.15 The digroup associated with the TPA unit can be removed from service by inserting a shorting plug into the force trunk-processing (FTP) test points on the front panel of the unit. In Mode 1 operation, the shorting plug removes the entire multiplex terminal from service.

E. PCU

2.16 This unit is used in all modes of operation. One PCU provides all voltages required by the multiplex terminal (two digroups). Due to its unique overvoltage and overcurrent protection circuitry, no fuses are required on the PCU. Test points on the front panel provide access to all PCU-developed voltages as well as −48V and 20-Hz ringing voltage. A 36-kHz free-running oscillator in the PCU enables precise voltage levels to be maintained by the PCU. A red PWR FAIL LED provides a visual indication of the status of the unit.

F. EQL

2.17 One EQL is required per LI- or digital (HF) output of the terminal. This unit provides for the equalization of the transmitted signal from the output of the LI- to the span terminating equipment (office repeater bay) or equivalent. The EQL used depends on the distance from the multiplex terminal to the span terminating equipment (or equivalent).

G. LI-1, LI-2, LI-3

2.18 One LI- is required per two digroups in Modes 1 and 2, and one is required for each digroup in Mode 3. One LI-4T and one LI-4R are required for all four digroups in Mode 4. This unit provides clocking, interfacing buffers, and the multiplex/demultiplex circuitry necessary for its designated mode of operation. The number after the LI- designation indicates the compatible mode of operation.

2.19 Generally, the LI- performs the unipolar-to-bipolar format conversion and arranges the transmitted signal format (including control bit insertion). Digroup (or terminal in Mode 1) looping is performed by the LI- under control of the TPA unit. An alternate looping is also provided via the LOOP test points. This LI- loop, initiated by the insertion of a shorting plug in the LOOP test points, does not necessitate a CGA condition as opposed to the digroup (or terminal) looping. The intent of the LI- loop is to provide for "hot-standby" operation between system installation and final system turn-up, should that be an extended period of time. During LI- loop, the alarm reporting is active and all channel unit signaling highways are available for testing purposes.

H. CTU

2.20 One CTU is required in Mode 1 operation only. This unit is a plug-in cross-connect between digroups A and B which allows for the use of only one TPA unit in Mode 1 operation.

I. OIU

2.21 This unit is optional. One OIU serves two digroups. The OIU provides proper interface for external timing applications. For loop timing applications, where synchronization of the received clock (from far-end office) to the transmit clock is required at the local terminal, the OIU/LT should be used. For applications requiring the use of an external office clock or a DDS clock, the OIU/DDS should be used.

3. FUNCTIONAL OPERATION

GENERAL

3.01 Refer to Fig. 7 through 9. The operation of the digroup channel units, the TLU, and the RLU are the same for all modes of operation. The major differences in the modes is a function of each LI-. The operation of the channel units, TLU, and RLU is described in Para. 3.02

through 3.05. The function of the different LI-s is described in Para. 3.06 through 3.09.

CHANNEL UNITS AND TLU

3.02 VF signals and signaling information from a trunk circuit are applied to a channel unit. The channel unit provides amplification and filtering of the VF signal. The VF signal and signaling information are converted (encoded) by the channel unit into 8-bit PCM words. This encoded PCM is the output of the channel unit.

3.03 The output of each channel unit in a digroup is sampled by the TLU in sequence. This sampling produces a stream of pulses to provide a channel sequence to match that of the far-end equipment (D1D, D2, or D3). The TLU times the signal and adds framing data to the bit stream. Except for Mode 1 operation, each TLU in the multiplex terminal uses a different clock signal for timing the bit stream. This is called asynchronous operation. In Mode 1 operation, both TLUs in the terminal use the same clock for timing the bit stream. This is called synchronous operation. The output of each TLU is applied to the appropriate LI- (Para. 3.06 or 3.08).

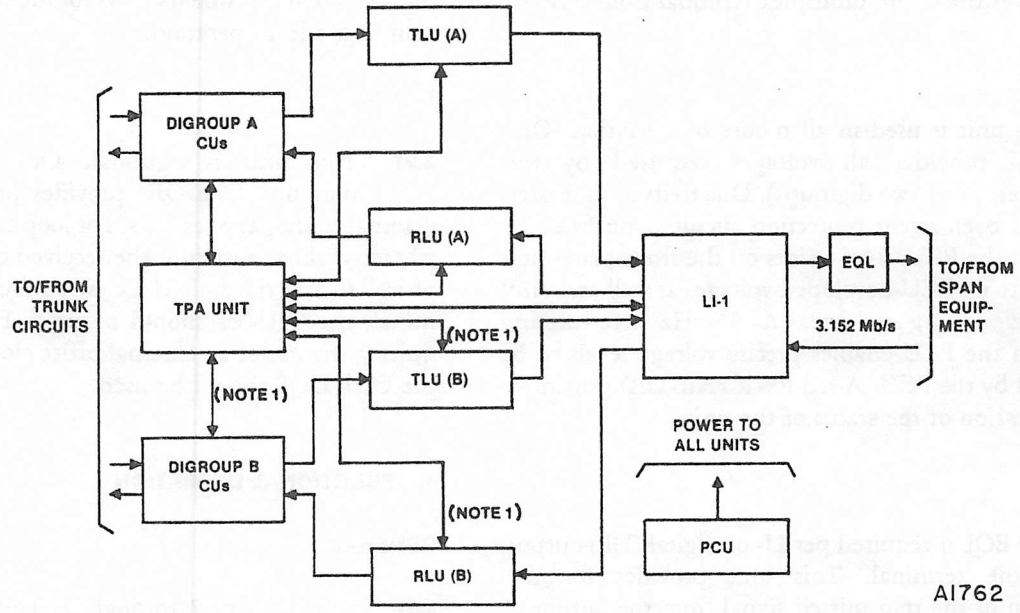
RLU AND CHANNEL UNITS

3.04 The RLU accepts PCM data from its appropriate LI- (Para. 3.07 or 3.09). The RLU removes the framing information from the bit stream to check framing. Clock is extracted from the bit stream by the RLU. The RLU uses the clock to synchronize the receive side of the digroup to the far-end digroup. As explained in Para. 3.03, the RLUs in a Mode 1 terminal operate synchronously, while the RLUs in a Mode 2 or 3 terminal operate asynchronously.

3.05 The RLU demultiplexes the bit stream it receives into the separate channel unit PCM words and applies the appropriate PCM words to each channel unit in sequence. The channel unit converts (decodes) each PCM word into its proper VF signal and signaling information. The VF signal is filtered and amplified by the channel unit. The channel unit applies the VF signal and signaling information to the trunk circuit.

LI-1 and LI-2 (FIG. 7 AND 8)

3.06 The operation of the LI-1 and LI-2 are very similar. On the transmit side, the LI-1 or LI-2 accepts the output of the TLU(A) and TLU(B) (Para. 3.02 and 3.03). These inputs are combined together by interleaving the bit streams bit-by-bit and adding appropriate control bits. The control bits added by the LI-2 are M1C-compatible.



NOTE:
1. CONNECTION VIA CTU.
2. LETTERS IN PARENTHESES ARE DIGROUP DESIGNATIONS.

Fig. 7—D448 Multiplex Terminal, Mode 1, Functional Block Diagram

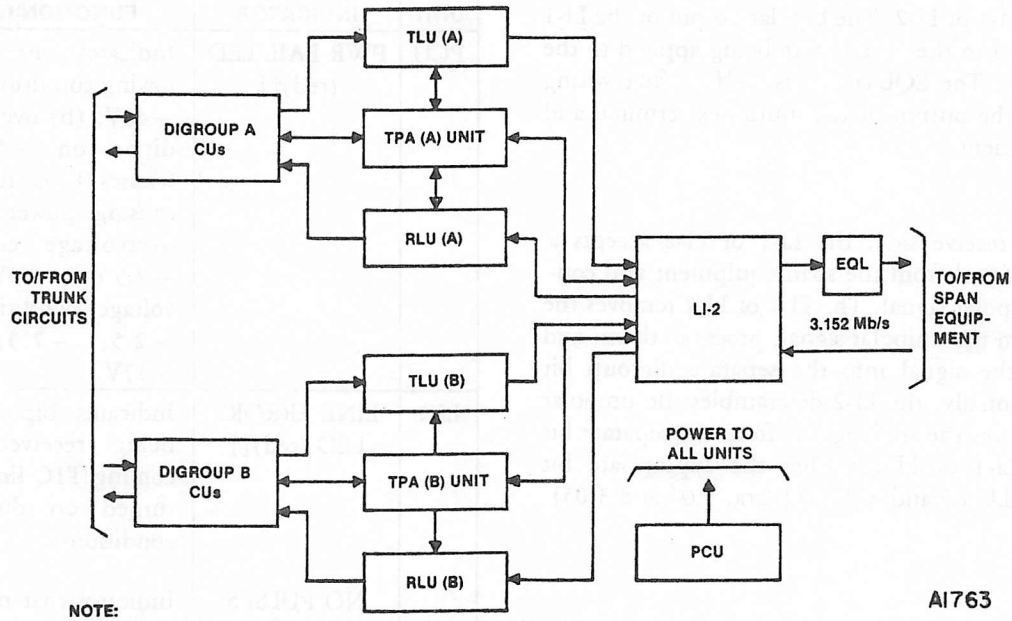


Fig. 8—D448 Multiplex Terminal, Mode 2, Functional Block Diagram

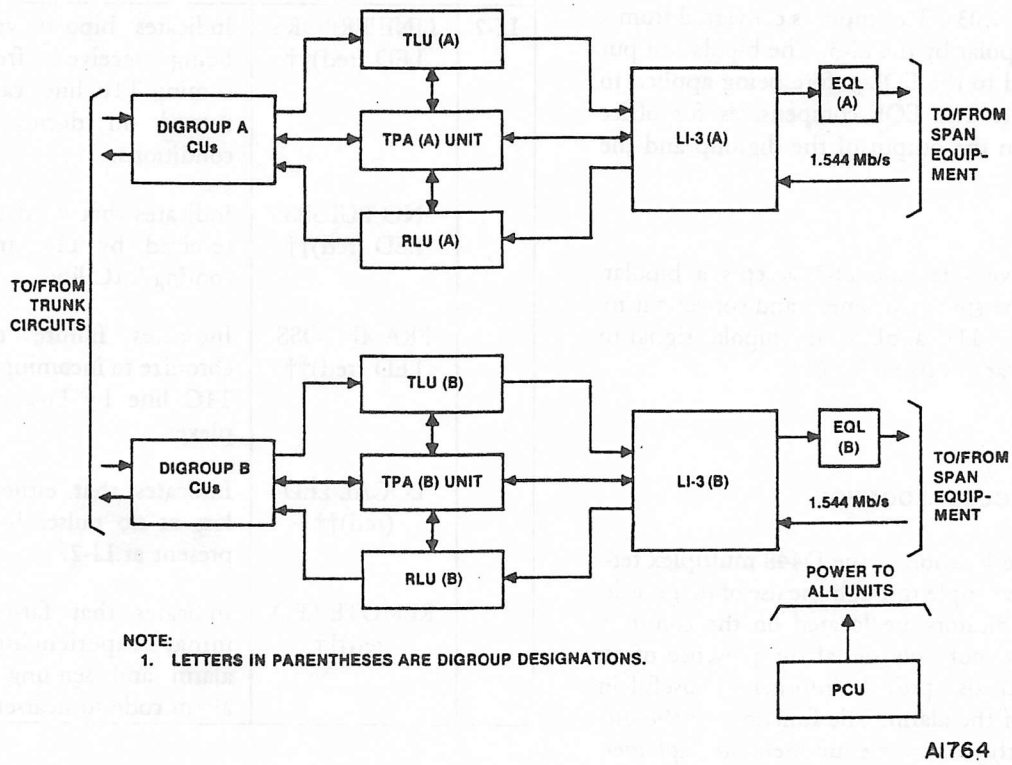


Fig. 9—D448 Multiplex Terminal, Mode 3, Functional Block Diagram

Additionally, the LI-2 adds stuffing to the independent 1.544 Mb/s bit streams and scrambles the combined data to produce an M1C-compatible bit stream. The interleaved bit stream is converted from a unipolar signal to bipolar by the LI-1 or LI-2. The bipolar output of the LI-1 or LI-2 is applied to the EQL before being applied to the span equipment. The EQL compensates for office wiring losses between the output of the multiplex terminal and the span equipment.

3.07 On the receive side, the LI-1 or LI-2 accepts a bipolar signal from the span equipment and converts it to a unipolar signal. The LI-1 or LI-2 removes the control bits from the unipolar signal, processes them, and demultiplexes the signal into the separate digroup bit streams. Additionally, the LI-2 descrambles the unipolar signal and removes the stuffing bits from the separate bit streams. The LI-1 or LI-2 applies the appropriate bit stream to the RLU(A) and RLU(B) (Para. 3.04 and 3.05).

LI-3 (FIG. 9)

3.08 Mode 3 operates with two totally independent digroups and, therefore, two totally independent LI-3s. Since the operation of either digroup is identical to the other, the operation of only one LI-3 will be explained. On the transmit side, the LI-3 accepts the output of its TLU (Para. 3.02 and 3.03). This input is converted from a unipolar signal to bipolar by the LI-3. The bipolar output of the LI-3 is applied to the EQL before being applied to the span equipment. The EQL compensates for office wiring losses between the output of the digroup and the span equipment.

3.09 On the receive side, the LI-3 accepts a bipolar signal from the span equipment and converts it to a unipolar signal. The LI-3 applies the unipolar signal to its associated RLU (Para. 3.04 and 3.05).

4. TESTING AND TROUBLE LOCATION

4.01 Alarm trouble location of the D448 multiplex terminal is made simple through the use of diagnostic indicators. These indicators are located on the common equipment units and not only signal the presence of an alarm condition, but also provide information useful in isolating the cause of the alarm. The functions of the different indicators on the common equipment are explained in Table H.

TABLE H

COMMON EQUIPMENT INDICATOR FUNCTIONS

UNIT	INDICATOR	FUNCTION (WHEN ON)
PCU	PWR FAIL LED (red)††	Indicates one of the following conditions: (a) loss of −48V; (b) overvoltage condition on −5 or −10V (causes PCU to shut down causing power failure); (c) overvoltage condition on −2.5 or −7.5V; (d) undervoltage condition on +7, −2.5, −7.5, −10, or −17V.
LI-1	LINE ERRORS LED (red)††	Indicates bipolar violations being received from incoming T1C line; cannot be turned on during looped conditions.
	NO PULSES LED (red)††	Indicates that no data being received by LI-1 from incoming T1C line.
	SYNC FAIL LED (red)††	Indicates failure of LI-1 to synchronize to receive data bit stream.
LI-2	LINE ERRORS LED (red)††	Indicates bipolar violations being received from incoming T1C line; cannot be turned on during looped conditions.
	NO PULSES LED (red)††	Indicates that no data being received by LI-2 from incoming T1C line.
	FRAME LOSS LED (red)††	Indicates failure to synchronize to incoming data on T1C line by LI-2 demultiplexer.
	LOCAL LED (red)††	Indicates that either frame loss or no pulses indication present at LI-2.
	REMOTE LED (red)††	Indicates that far-end terminal experiencing local alarm and sending remote alarm code to near-end LI-2.

††These indicators are considered alarm indicators.

TABLE H (CONT)

UNIT	INDICATOR	FUNCTION (WHEN ON)
LI-2	PASS LED (green)	Indicates that RLUs of both digroups are synchronizing to TLUs data while data is being multiplexed by LI-2; can be activated only when terminal is looped and FAST TEST switch on LI-2 is pressed.
	FAIL LED (red)	Indicates that conditions described for PASS LED above are not true; can be activated only as described above.
LI-3	ERROR LED (red)††	Indicates bipolar violations on incoming line; cannot be turned on during looped conditions.
	NO PULSES LED (red)††	Indicates that no data incoming to LI-3; if turned on when digroup is looped, indicates digroup failure rather than line failure.
RLU	FR LOSS LED (red)††	Indicates failure to synchronize with incoming data.
TPA Unit	TPA lamp (red)††	Indicates that trunk processing taking place (digroup in alarm) or that a CGA bus has been pulled to ground.
	LCA LED (red)††	Indicates that LCA bus is active (digroup in local alarm); may be caused by one of several types of failures.
	RMA LED (yellow)††	Indicates that far-end multiplexer is experiencing local alarm and sending remote alarm code (all bit 2s are zeros).
		Note: If RMA and LCA LEDs are both on, it indicates that the far-end multiplexer is looped (all ones received by near-end).

TABLE H (CONT)

UNIT	INDICATOR	FUNCTION (WHEN ON)
	TPAF LED (red)††	Indicates that TPA unit has failed.
	ACO LED (green)	Indicates that ACO button has been pressed to cut off office alarms.
	LOOP LED (green)	Indicates that digroup is looped (either by pressing of LOOP button on TPA unit or by inserting shorting plug in LOOP test points on LI-3).
	TP MEM LED (yellow)	Indicates that trunk processing is taking place or has taken place; will turn on only if TP MEM button on TPA unit is in on position (pushed in); will turn off only when TP MEM button is in off position (released).

††These indicators are considered alarm indicators.

4.02 Installation testing and transmission trouble location of the D448 multiplex terminal are greatly simplified by the use of the automated test and alignment unit (ATAU), 628450-0, in conjunction with the test interface unit (TIU), 628455-0.

Note: D448 multiplex terminals equipped with D448 dataports may be tested via the data test interface (DTI), 628458-0, which allows synchronization of a customer test set with DS-0 (64 kb/s) level data.

4.03 The ATAU (Fig. 10) is a self-contained piece of portable test equipment. The TIU provides the necessary interface between the ATAU and the common equipment (PCM) in the terminal. The ATAU is used to perform single-ended testing on a single channel unit while the remainder of the terminal remains in service. Single-ended testing means analog-to-digital (transmit) and digital-to-analog (receive). Analog (VF) access is via the channel unit splitting card jack. Digital (PCM) access is provided by the TIU. Single-ended tests that can be conducted are signaling, VF level, tracking, signal-to-distortion, and idle channel noise. Other capabilities of the ATAU include determination of network build-out capacitance (NBOC) setting and end-to-end functions. The end-to-end capabilities are crosstalk measurements,

oscillator functions, and level (noise and signal) meter functions. The different tests that can be performed using the ATAU are listed in Table I.

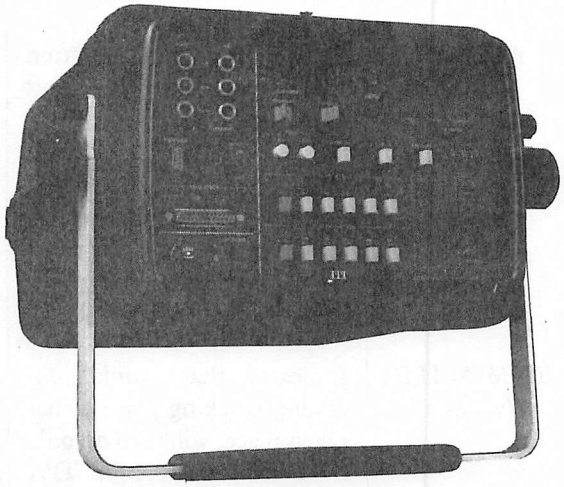


Fig. 10—Automated Test and Alignment Unit

TABLE I

ATAU TESTS

TEST	SINGLE-ENDED	END-TO-END
Signaling	Yes	No
VF Level	Yes	Yes
Tracking	Yes	Yes
Signal-to-Distortion	Yes	Yes
Idle Channel Noise	Yes	Yes
Balance	Yes	No
Crosstalk	No	Yes

4.04 When testing is performed on a single-ended basis, the tests can be done either automatically or manually. When done automatically, total testing on each channel unit (signaling, VF level [receive and transmit], tracking [receive and transmit], signal-to-distortion [receive and transmit], idle channel noise [receive and transmit], and balance) can be accomplished in just over one minute (total time).

5. ACCESSORY EQUIPMENT

JACK PANEL, 623129

5.01 The jack panel provides 48 standard telephone jacks (239-type) mounted on a jackstrip. The jack panel is used with 310-type plugs. The jack panel is an optional item used for testing and to facilitate service restoration. It may be wired for line/equipment (insertion) or monitor provisions for the channel unit VF and/or signaling leads as required.

5.02 The jack panel mounts on one vertical mounting space (1.75 inches) on a 19-inch relay rack. An adapter plate is required for mounting on a 23-inch rack.

FUSE, ALARM AND DISTRIBUTION PANEL (FADP), 628490 AND 628492

5.03 The FADP distributes −48V battery, −48 talk battery, −48V alarm battery supply, and 20-Hz negative superimposed ringing voltage; monitors the battery and ringing distribution circuits for fuse alarm conditions; provides connections for fuse alarm and terminal alarm multiples (buses); and provides termination tie points for connecting the HF transmit and receive pairs and for connecting audible, visual, electronic switching system (ESS), and E2 alarm signals. Active circuitry in the FADP is part of the alarm and ballast unit (ABU) which mounts in the FADP. Two ABUs are available with the 628490 FADP: ABU-1, 628494-0, or ABU-2, 628496-0. The ABU-1 is used when negative superimposed ringing is required and available. The ABU-2 is used when negative superimposed ringing is required but not available. The ABU-1 and ABU-2 must be ordered separately. The 628492 FADP is equipped with ABU, 628492-025-001.

5.04 The FADP mounts on two vertical mounting spaces (3.5 inches). The 628490 FADP mounts on a 23-inch relay rack. The 628492 FADP mounts on a 19-inch relay rack. The FADP is provided in the D448 prewired bays (Para. 2.07).

CHANNEL EXTENDER UNIT (CEU), 628460-0

5.05 The CEU extends a channel unit beyond the front edge of the multiplex shelf. When a channel unit is installed in the CEU and the CEU is installed in the channel unit's multiplex shelf position, physical access to channel unit options is provided while the channel unit is in service. Inclusion of seven bantam-type jacks and a splitting card jack provide additional flexibility for various patching requirements or mechanics.

CHANNEL EXTENDER UNIT (CEU), 628462-0

5.06 The CEU extends an ETS-4 channel unit (or other channel unit with proper option selected) beyond the front edge of the multiplex shelf. When the channel unit is in the CEU and the CEU is installed in the channel unit's multiplex shelf position, physical access to channel unit options is provided while the channel unit is in ser-

vice. Inclusion of seven bantam-type jacks and a splitting card jack provide additional flexibility for various patching requirements or mechanics.

COMMUNICATIONS PANEL, 623323 AND 623324

5.07 The communications panel is used to provide communications within a C.O. or to the plant orderwire facilities. Communications panel, 623323, provides a 10-button rotary dial and communications panel, 623324, provides a key telephone set.

5.08 The panel mounts in the unequal-flange upright of a 23-inch relay rack. No mounting space in this rack is required. The panel is fully connectorized for ease of installation.

6. SPECIAL FEATURES AND RESTRICTIONS

WARNING: This equipment contains static-sensitive (MOS) devices. Section ITTR-18-599 contains handling instructions for MOS-equipped units.

6.01 The toll-grade performance of the D448 multiplex terminal and the variety of signaling options available provide for toll-grade EAS, toll, toll-connecting, interoffice, foreign exchange, or special service operation.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the D448 trunk carrier system is provided in Table J.

TABLE J

TECHNICAL SPECIFICATIONS

ITEM	SPECIFICATION
GENERAL	
Number of Channels	48
Multiplex Technique	TDM
Modulation	PCM
Sampling	8000 samples per second
PCM Word Length	7-5/6 or 8 bits effective
Companding Law	15 segment, u = 255, non-linear
DIGITAL COMPATIBILITY	
Mode 1	3.152 Mb/s, bipolar, new line code
Mode 2	3.152 Mb/s, bipolar, standard line code, compatible with M1C
Mode 3	1.544 Mb/s, bipolar
Mode 4	6.312 Mb/s, B6ZS
TRANSMISSION MEDIUM	
Modes 1 and 2	ITT T148C span line, ITT TX1C span line, WE T1C-type span line, microwave radio, or equivalent
Mode 3	T1 span line, microwave radio, or equivalent
Mode 4	T2 span line, microwave radio, or equivalent
VF CHARACTERISTICS	
Impedance	
2WEM6, 2WEM6A, DPO6, SDPO6, DPT6, DPT6I	600 ohms + 2.16 uF
2WEM9, 2WEM9A, DPO9, SDPO9, DPT9, DPT9I, 2WFXO, 2WFXS, 2WDX, 2WPLAR	900 ohms + 2.16 uF
4WEM, 4WTO, 4WTO/SF, 4WPLR, 4WEMD, 4WTDM, 4WEVF	600 ohms
4WETO, 4WFXO/VF, 4WFXO, 4WFXS, 4WFXS/VF, 4WDX/VF, 4WDX	150/600/1200 ohms (determined by option)
Levels	
4WEM	
Transmit	−16.0 to −17.5 dBm, adjustable in 0.1-dB steps
Receive	+7.0 to +8.5 dBm adjustable in 0.1-dB steps

TABLE J (CONT)

ITEM	SPECIFICATION
2WEM9, 2WEM6, 2WEM9A, 2WEM6A, DPO9, DPO6, SDPO9, SDPO6, DPT9, DPT6, DPT9I, DPT6I, 2WFXO, 2WFXO/LS, 2WFXS, 2WFXS/LS	
Transmit	0 to −4.5 dBm, adjustable in 0.1-dB steps
Receive	+1.5 to −6.0 dBm, adjustable in 0.1-dB steps
2WFXS/EVF, 2WDX, 2WPLAR	
Transmit and Receive	+6.0 to −9.0 dBm,* adjustable in 0.1-dB steps
4WTO, 4WTO/SF, 4WETO, 4WFXO/VF, 4WFXO, 4WFXS/VF, 4WFXS, 4WDX/VF	
Transmit	+9.0 to −23.5 dBm, adjustable in 0.1-dB steps
Receive	+10.5 to −22.0 dBm, adjustable in 0.1-dB steps
4WPLR, 4WEVF	
Transmit	−16.0 to −17.5 dBm or +7.0 to +5.5 dBm, adjustable in 0.1-dB steps
Receive	+7.0 to +8.5 dBm or −16.0 to −14.5 dBm, adjustable in 0.1-dB steps
4WTDM	
Transmit and Receive	+2.1 dBm
Loss Stability	±0.5 dB over life in 95% of the circuits
Tracking	
−37 to +3 dBm0 Input	0.5 dB maximum deviation
−50 to −37 dBm0 Input	1.0 dB maximum deviation

TABLE J (CONT)

ITEM	SPECIFICATION
Idle Channel Noise (end-to-end)	23 dBrnc0 maximum
Signal-to-Distortion	
0 to −30 dBm0 Input	33 dB minimum overall, 35 dB minimum receive or transmit
−40 dBm0 Input	27 dB minimum overall, 29 dB minimum receive or transmit
−45 dBm0 Input	22 dB minimum overall, 25 dB minimum receive or transmit
Single Frequency Distortion	
0 dBm0 Input Swept From 0 to 12 kHz	−28 dBm0 or less at any other frequency
0 dBm0 Input Between 1004 and 1020 Hz	−40 dBm0 or less at any other frequency from 0 to 4 kHz with a distortion contribution objective from either receive or transmit of typically 6 dB better
4-Wire Return Loss	
1000 Hz	28 dB minimum
300 to 3000 Hz	23 dB minimum
2-Wire Echo Return Loss (measured against nominal impedance with 25 ohms in series with channel unit and no far-end channel unit)	28 dB minimum
2-Wire Singing Return Loss (measured against nominal impedance with 25 ohms in series with channel unit and no far-end channel unit)	20 dB minimum
Transhybrid Loss (2-wire channel units only)	
200 to 500 Hz	20 dB minimum

*Maximum range meeting all specifications.

TABLE J (CONT)

ITEM	SPECIFICATION
500 to 1000 Hz	30 dB minimum for 900-ohm channel units, 28 dB minimum for 600-ohm channel units
1000 to 2500 Hz	35 dB minimum for 900-ohm channel units, 30 dB minimum for 600-ohm channel units
2500 to 3400 Hz	30 dB minimum for 900-ohm channel units, 28 dB minimum for 600-ohm channel units
Frequency Response	
4-Wire Channel Units (referenced to 1020 Hz, end-to-end)	
60 Hz	14.0 dB minimum loss
200 Hz	0 to −3.0 dB
300 to 3000 Hz	±0.3 dB
3200 Hz	+0.15 to −1.5 dB
3400 Hz	0 to −3.0 dB
2-Wire, 900-Ohm Channel Units (referenced to 1020 Hz, end-to-end)	
60 Hz	20.0 dB minimum loss
200 Hz	0 to −5.0 dB
300 to 3000 Hz	+0.5 to −1.0 dB
3200 Hz	+0.25 to −1.5 dB
3400 Hz	0 to −3.0 dB
2-Wire, 600-Ohm Channel Units (referenced to 1000 Hz, at 0 dBm0 end-to-end)	
60 Hz	20 dB minimum loss
600 to 2400 Hz	±1 dB
300 to 3400 Hz	+1 dB to −3 dB
Balance Network (2-wire channel units only)	Compromise network of 900 or 600 ohms plus 2.16 uF built-in with build-out capacitance in 0.002-uF steps to 0.126 uF (NT and NR are brought out for connection to external precision balance network)

TABLE J (CONT)

ITEM	SPECIFICATION
Longitudinal Balance	
2-Wire Channel Units Only	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
4-Wire Channel Units Only (excluding special service channel units)	
200 Hz	86 dB minimum
1000 Hz	80 dB minimum
3000 Hz	78 dB minimum
Crosstalk Coupling Loss	65 dB minimum (700 to 1100 Hz)
Peak-to-Average Ratio (P/AR)	94 minimum
SIGNALING CHARACTERISTICS	
E&M Channel Units	
Transmit Threshold Voltage (M lead)	>20 Vdc with 1K ohm to M lead
Transmit Battery Signal (MB lead)	−48 Vdc through 910 ohms
Pulsing Distortion	
Input	12 pps, 30 to 90% break
Output	±2.0% maximum
DPO/DPT Channel Units	
Pulsing Distortion	
Input (at DPO)	150/150 ohm battery-ground pulsing at 12 pps, 73% break over 600-ohm VF extension to the channel unit
Output (at DPT)	71% break maximum
Input (at DPO)	150/150 ohm battery-ground pulsing at 12 pps, 49% break over 0-ohm loop
Output (at DPT)	39% break minimum
Input (at DPO)	Loop pulsing at 12 pps, 68% break, with 2 uF and 600 ohms across pulsing contact, over 600-ohm VF extension to the channel unit

TABLE J (CONT)

ITEM	SPECIFICATION
Output (at DPT)	66% break maximum
Input (at DPO)	Loop pulsing at 12 pps, 58% break, with 2 uF and 600 ohms across pulsing contact, with no VF extension to the channel unit
Output (at DPT)	45% break minimum
SDPO/DPT Channel Units	
Pulsing Distortion	
Input (at SDPO)	Loop pulsing at 12 pps, 64% break with 1500 ohms external loop resistance
Output (at DPT)	65% break maximum
Input (at SDPO)	Loop pulsing at 12 pps, 58% break, 4 C4A ringers and 15K ohms leak resistance
Output (at DPT)	40% break minimum
Input (at SDPO)	150/150 ohm battery-ground pulsing at 12 pps, 73% break over 2000-ohm loop conductors
Output (at DPT)	74% break maximum
Input (at SDPO)	150/150 ohm battery-ground pulsing at 12 pps, 49% break over 0-ohm loop
Output (at DPT)	41% break minimum
FXS/FXO Channel Units	
Pulsing Distortion	
Input (at FXS)	Loop pulsing at 12 pps, 64% break with 1500 ohms external circuit resistance
Output (at FXO)	69% break maximum

TABLE J (CONT)

ITEM	SPECIFICATION
Input (at FXS)	Loop pulsing at 12 pps, 58% break, 4 C4A ringers, and 15K ohms leak resistance
Output (at FXO)	43% break minimum
POWER REQUIREMENTS	
Note: The power drain and dissipation as listed below assumes a fully-equipped "typical" D448 multiplex terminal and should not be considered as an exact figure for partially equipped terminals or a different channel unit "mix."	
Common Equipment	
Mode 1	18.9W (393 mA at −48 Vdc)
Mode 2	19.3W (402 mA at −48 Vdc)
Mode 3	18.0W (375 mA at −48 Vdc)
Mode 4	Not presently available
Channel Units	Refer to Table K
Example	Power requirements of a fully-equipped Mode 3 terminal with 24 2-wire E&M channel units and 24 dial pulse terminating channel units and with a 50 percent busy condition are given in Table L
CHANNEL CAPACITY PER BAY	
11-Ft 6-In. Bay	
23-In.	336 channels, maximum
19-In.	240 channels, maximum
9-Ft Bay	
23-In.	240 channels, maximum
19-In.	192 channels, maximum
7- and 8-Ft Bay	
23-In. (7-Ft Only)	192 channels, maximum
19-In.	144 channels, maximum
BAY FLOOR SPACE REQUIREMENTS	
Note: The below floor space requirements are defined as the area of a rectangle formed by the framesides and the centerline of the front (maintenance) and rear (wiring) aisles. In the case of a bay arrangement consisting of more than one bay, the arrangement floor area is the floor area of a bay times the number of bays in the arrangement.	

TABLE J (CONT)

ITEM	SPECIFICATION
11-Ft 6-In. Bay	
23-In.	8.24 sq ft (0.77 sq m)
19-In.	6.40 sq ft (0.59 sq m)
9-Ft Bay	
23-In.	8.24 sq ft (0.77 sq m)
19-In.	5.55 sq ft (0.52 sq m)
7- and 8-Ft Bay	
23-In. (7-Ft Only)	7.02 sq ft (0.65 sq m)
19-In.	5.55 sq ft (0.52 sq m)
RELIABILITY DATA	Available on request
MECHANICAL CHARACTERISTICS	
Prewired Bays	Refer to Table M
Multiplex Shelf	
Dimensions	
Number of Mounting Spaces	10
Height	17.5 in. (44.5 cm)
Width	23.0 in. (58.4 cm)
Depth	12.0 in. (30.5 cm)
Weight (Empty)	20.0 lb (9.1 kg)
Number of Channels	48 maximum
Unit Weights	
EQL	0.3 lb (0.1 kg)
LI-3	0.4 lb (0.2 kg)
4WEM, 4WTO, 4WPLR	0.8 lb (0.4 kg)
TLU, RLU, TPA Unit, 4WTO/SF, 4WETO, 4WEMD, ETS-4, 4WTDM, 4WEVF	0.9 lb (0.4 kg)
LI-2, DPT9, DPT6, DPT9I, DPT6I, 2WFXO, 2WFXO/LS	1.0 lb (0.5 kg)
2WEM9, 2WEM6, 2WEM9A, 2WEM6A, DPO9, DPO6, SDPO9, SDPO6, 4WFXO, 4WFXO/VF	1.1 lb (0.5 kg)

TABLE J (CONT)

ITEM	SPECIFICATION
2WFXS, 2WFXS/EVF, 2WFXS/LS, 4WFXS/VF, 4WFXS	1.2 lb (0.5 kg)
4WDX/VF, 4WDX, 2WDX, 2WPLAR	1.3 lb (0.6 kg)
LI-1	1.5 lb (0.7 kg)
PCU	6.9 lb (3.1 kg)
Example	An 11-ft 6-in. bay (23-in.) fully-equipped with 7 multiplex terminals (336 channels), operating in Mode 3, and each terminal equipped with 24 2-wire E&M channel units and 24 dial pulse terminating channel units would weigh:

	lb	kg
1 Bay	286.0	129.7
14 TLUs	12.6	5.7
14 RLUs	12.6	5.7
14 TPA Units	12.6	5.7
7 PCUs	48.3	21.9
14 EQLs	4.2	1.9
168 2WEMs	184.8	83.8
168 DPTs	168.0	76.2
TOTAL	729.1	330.6

OPERATING ENVIRONMENT	
Temperature	0° to 55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)

TABLE K

CHANNEL UNIT POWER REQUIREMENTS

TYPE	POWER DRAIN WATTS (mA at 48 Vdc)		POWER DISSIPATION WATTS‡	LOOP OR E/M RESISTANCE
	IDLE	BUSY†		
2WEM	0.28 (5.8)	0.69 (14.4)	0.98	500 ohm
4WEM	0.28 (5.8)	0.69 (14.4)	0.98	500 ohm
DPT	0.29 (6.0)	0.71 (14.8)	1.69	600 ohm
DPO	0.43 (9.0)	1.53/1.83 (31.9)	1.06/1.83	1000/500 ohm
SDPO	0.52 (10.8)	2.86/3.21 (59.6)	1.70/2.05	700/500 ohm
2WFXO	0.50 (10.4)	0.93 (19.4)	2.34	400 ohm
2WFXS	0.52 (10.8)	2.84 (59.2)	1.68	700 ohm
2WFXS/EVF	0.41 (8.3)	2.20 (56.7)	1.65	700 ohm
4WTO	0.26 (5.4)	—	0.26	—
4WTO/SF	0.26 (5.4)	—	0.26	—
4WPLR	0.32 (6.5)	1.47 (30.4)	1.17	7,000 ohm
4WETO	0.31 (6.0)	—	0.31	—
4WFXO	0.48 (10.8)	0.91 (19.1)	2.33	400 ohm
4WFXS	0.43 (9.0)	2.95 (58.7)	1.63	700 ohm
4WTDM	0.35 (6.9)	0.91 (18.5)	0.91	10,000 ohm
4WEVF	0.29 (6.0)	0.70 (14.6)	0.99	500 ohm

†Column lists total power consumed including idle.

‡Total power dissipation of a channel unit shown in this column includes idle power drain. The power dissipation factor includes only that portion of the busy power drain which is dissipated in the channel unit. Channel units listed with a busy power drain factor exceeding the power dissipation factor reflect units providing power to the loop and the difference is dissipated in the loop (external to the channel unit).

TABLE L

CHANNEL UNIT POWER REQUIREMENTS EXAMPLE

UNIT (CONDITION)	POWER DRAIN	POWER DISSIPATION
2WEM (BUSY)	0.69 x 12 = 8.28	0.98 x 12 = 11.76
DPT (BUSY)	0.71 x 12 = 8.52	1.69 x 12 = 20.28
2WEM (IDLE)	0.28 x 12 = 3.36	0.28 x 12 = 3.36
DPT (IDLE)	0.29 x 12 = 3.48	0.29 x 12 = 3.48
Mode 3 Common	18.00	18.00
	TOTAL 41.64W (0.87A)	TOTAL 56.88W (1.19A)

TABLE M

PREWIRED BAY MECHANICAL CHARACTERISTICS

HEIGHT ft (cm)	DIMENSIONS (Max) WIDTH in. (cm)	DEPTH in. (cm)	WEIGHT (Less Plug-Ins) lb (kg)	MAXIMUM NUMBER OF TERMINALS
		23-INCH		
11.5 (350.5)	26.4 (67.1)	12.0 (30.5)	286.0 (129.7)	7
9.0 (274.3)	26.4 (67.1)	12.0 (30.5)	207.0 (93.9)	5
7.0 (213.4)	25.9 (65.8)	12.0 (30.5)	168.0 (76.2)	4
		19-INCH		
11.5 (350.5)	20.5 (52.1)	12.0 (30.5)	286.0 (129.7)	5
9.0 (274.3)	20.5 (52.1)	12.0 (30.5)	207.0 (93.9)	4
8.0 (240.0)	20.5 (52.1)	12.0 (30.5)	178.0 (80.1)	3
7.0 (213.4)	20.5 (52.1)	12.0 (30.5)	168.0 (76.2)	3